

Miniature Gas Chromatograph Mass Spectrometer for In-Situ Resource Utilization, Phase II

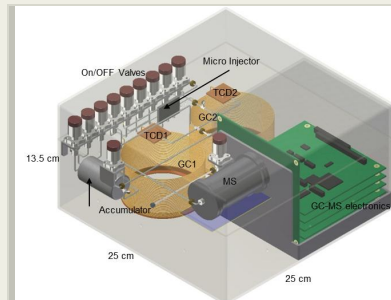
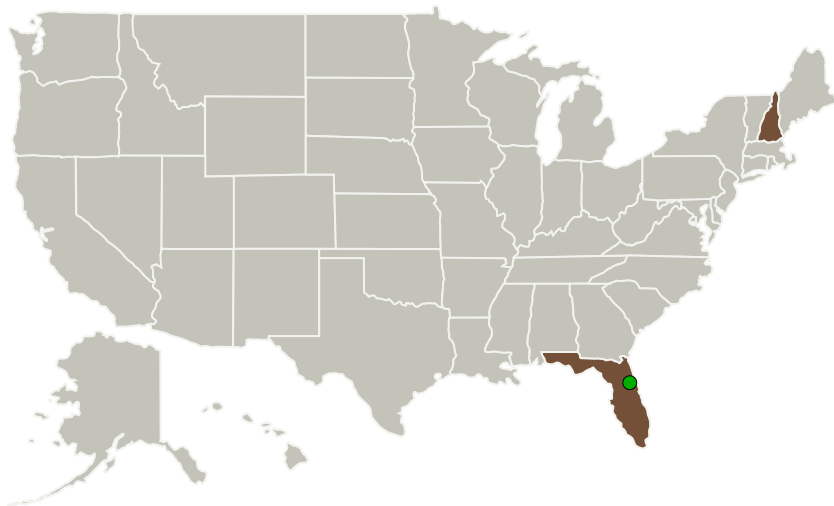
Completed Technology Project (2012 - 2014)



Project Introduction

In situ resource utilization (ISRU) is essential for several of NASA's future flagship missions. Currently envisioned ISRU plants include production of oxygen from hydrogen reduction of lunar regolith and extraction of water from Martian regolith or asteroid material. NASA's Regolith & Environmental Science and Oxygen & Lunar Volatile Extraction (RESOLVE) mission's objectives are to analyze the distribution of volatile compounds in the lunar surface and to demonstrate ISRU operation on the moon. To support ISRU activities, NASA requires the development of a compact, lightweight gas chromatograph/mass spectrometer (GC/MS) instrument that can quantify volatile gases with masses below atomic number 70 released by sample heating. The instrument must also be designed to withstand exposure to the release of HF, HCl, or Hg that may result from heating regolith samples to high temperatures. Creare proposes to design, build, and test a compact, lightweight GC/MS system capable of detecting, identifying, and quantifying 100 ppm to 100%-level concentrations of relevant compounds having mass less than 70 amu. Our GC/MS design is based on components that can be space qualified using techniques proven on numerous past space hardware development projects. During the Phase I project, we proved our design with benchtop testing, and in Phase II, we plan to build a brassboard version of our GC/MS that will meet the important performance requirements for the intended application.

Primary U.S. Work Locations and Key Partners



Miniature Gas Chromatograph Mass Spectrometer for In-Situ Resource Utilization

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3
Target Destinations	3

Miniature Gas Chromatograph Mass Spectrometer for In-Situ Resource Utilization, Phase II

Completed Technology Project (2012 - 2014)



Organizations Performing Work	Role	Type	Location
Creare LLC	Lead Organization	Industry	Hanover, New Hampshire
● Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida

Primary U.S. Work Locations

Florida	New Hampshire
---------	---------------

Project Transitions

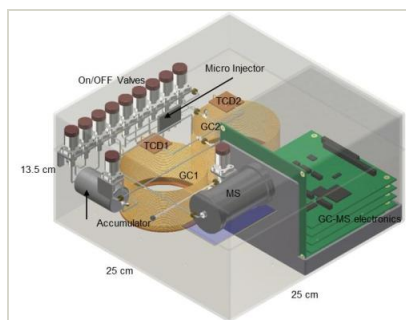
December 2012: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137321>)

Images



Project Image

Miniature Gas Chromatograph Mass Spectrometer for In-Situ Resource Utilization
(<https://techport.nasa.gov/image/129458>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Creare LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Paul H Sorensen

Co-Investigator:

Paul Sorensen

Miniature Gas Chromatograph Mass Spectrometer for In-Situ Resource Utilization, Phase II

Completed Technology Project (2012 - 2014)



Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX07 Exploration Destination Systems
 - └ TX07.1 In-Situ Resource Utilization
 - └ TX07.1.1 Destination Reconnaissance and Resource Assessment

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System